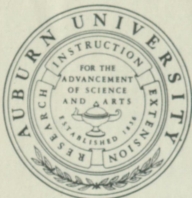


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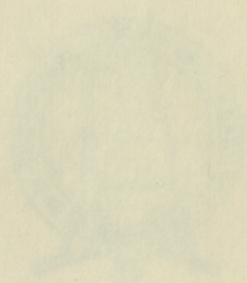
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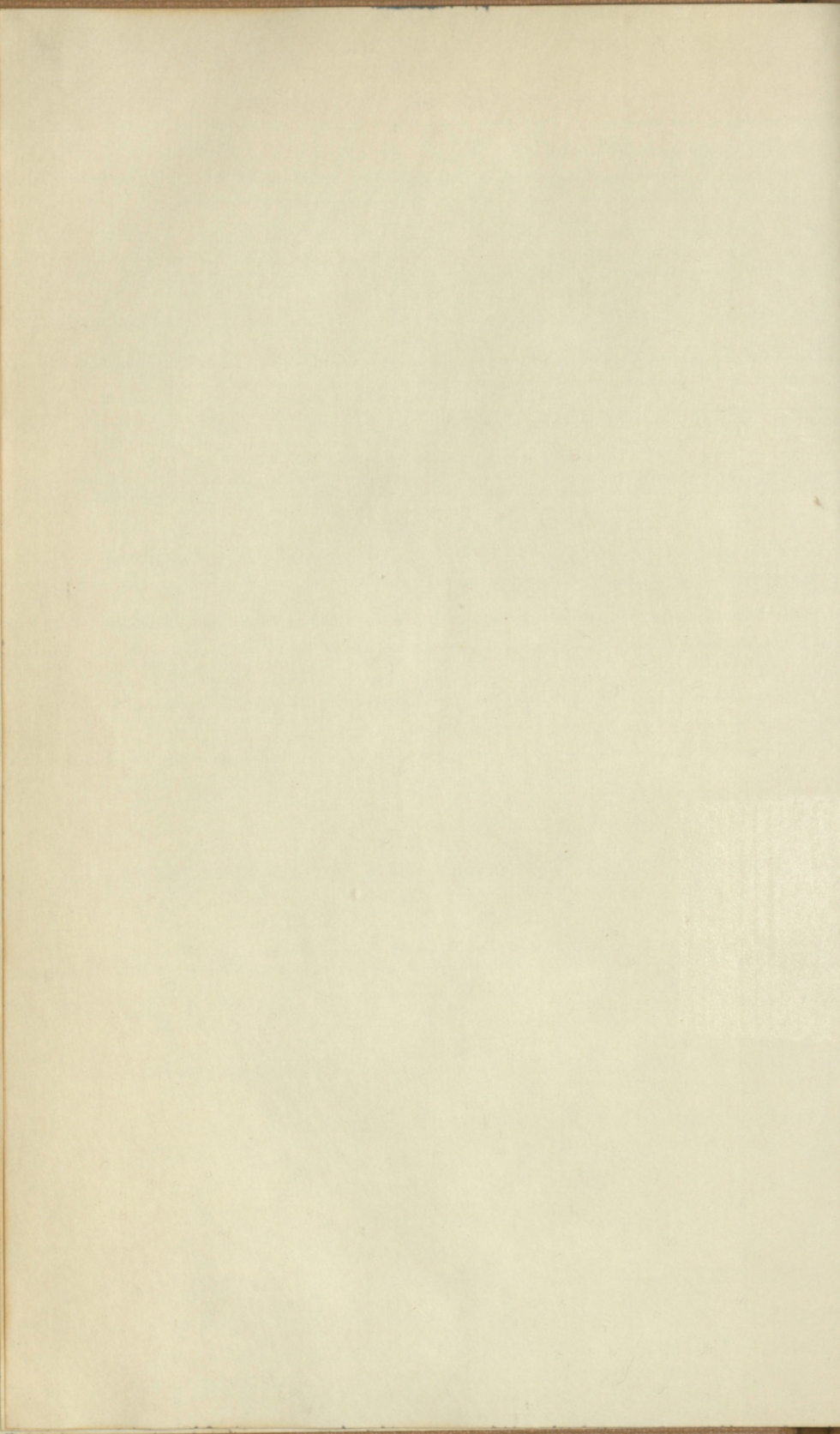
STATISTICS OF THE MINERAL
PRODUCTION OF ALABAMA
FOR 1910

DEPARTMENT OF COMMERCE, BUREAU OF MINES
WASHINGTON

MADE IN THE UNITED STATES



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GEOLOGICAL SURVEY OF ALABAMA



GEOLOGICAL SURVEY OF ALABAMA

EUGENE ALLEN SMITH, *State Geologist*

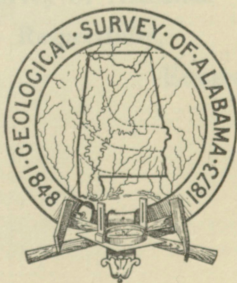
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STATISTICS OF THE MINERAL PRODUCTION OF ALABAMA FOR 1910

COMPILED FROM MINERAL RESOURCES OF THE
UNITED STATES.

By

CHARLES ARTHUR ABELE



MONTGOMERY, ALA.

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GEOLOGICAL SURVEY OF ALABAMA

EDWARD ALLEN SMITH, CHIEF

BULLETIN No. 12

STATISTICS OF THE MINERAL
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CHARLES ARTHUR ARLEE



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LETTER OF TRANSMITTAL.

University, Ala., March, 1912.

Hon. Emmet O'Neal,

Governor of Alabama,

Montgomery, Ala.

Sir:—I have the honor to transmit herewith the manuscript of a report on the Mineral Production of Alabama for the year 1910, with the request that it be printed as Bulletin No. 12 of the Geological Survey of Alabama.

Very Respectfully,

EUGENE A. SMITH,

State Geologist.

GEOLOGICAL CORPS.

Eugene Allen Smith, Ph. D.	State Geologist.
William F. Prouty, Ph. D.	Chief Assistant.
Robert S. Hodges	Chemist
Herbert H. Smith	Curator of Museum.
Roland M. Harper	Botanist.
George N. Brewer	Field Assistant
Charles Arthur Abele	
	Clerk in charge of Statistics of Mineral Production.
James A. Anderson	Clerk in charge of Mailing List.
A. T. Donoho	Stenographer.

RIVER GAGE HEIGHT OBSERVERS.

C. J. Stowe	Jackson's Gap, Tallapoosa River.
J. E. Whitehead	Riverside, Coosa River
George Havens	Epes, Tombigbee River.
J. M. Hodge	Newton, Choctawhatchie River.
W. G. Early	Pera, Pea River
J. F. Hicks	Beck, Conecuh River

From the records of daily observations of the gage readings at these places when extended through sufficient time, the calculations of available horsepower to be obtained from the different streams is made.

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PREFACE.

The statistics of all the minerals included in the following pages have been collected in cooperation with the United States Geological Survey, and have been compiled by Mr. Abele from advance chapters of the *Mineral Resources of the United States*, a publication of the Federal Survey.

The introductory and general matter in each of these articles has either been taken without change from the U. S. advance chapters or has been rearranged or condensed from these chapters, or entirely rewritten to suit it for our present purposes. In each case credit is given to the author.

STATISTICS OF THE MINERAL PRODUCTION OF ALABAMA FOR 1910

ABRASIVES.

W. C. PHALEN.

Abrasive materials fall naturally into two classes—natural abrasives and artificial abrasives. The production of artificial abrasives has shown great increase since its beginning, less than 15 years ago, and the value of these abrasives produced in this country during the last two years has exceeded that of the natural abrasives.

Under the head of natural abrasives there are included the following materials: (1) Millstones and burrstones, (2) grindstones and pulpstones, (3) oilstones and scythestones, (4) emery, (5) abrasive garnet, (6) infusorial earth and tripoli, and (7) pumice.

PRODUCTION.

Alabama produced only a limited number of millstones in 1910.

BAUXITE.

W. C. PHALEN.

USES.

The chief uses of bauxite are (1) as raw material in the production of metallic aluminum; (2) in the manufacture of aluminum salts; (3) in the manufacture of artificial abrasives; and (4) in the manufacture of bauxite brick.

(1) The use of bauxite in the production of metallic aluminum is by far the most important of those enumerated above. A large part of the entire output of Arkansas is used in the metallic aluminum industry, and the figures of production from this State have shown phenomenal growth during recent years. A large part of the French product is also used in the manufacture of metallic aluminum.

(2) Only the purer bauxite is used in the manufacture of chemicals, such as alum, aluminum sulphate, and aluminum salts in general. Freedom from oxide of iron is essential in the material to be used in the chemical manufactures.

(3) Bauxite is used on a large scale in the manufacture of the artificial abrasive, alundum, at Niagara Falls. This abrasive is made in the electric furnace by fusing calcined bauxite. It is high in crystalline aluminum oxide, and virtually amounts to a form of artificial corundum. Its quality is under complete control, and hence it can be duplicated with ease in the various abrasive products, a factor of great importance in any successful abrasive industry. Alundum is particularly efficient in the grinding of steel.

(4) The use of bauxite in the manufacture of refractory brick has by no means reached a perfected stage, but it is understood that several manufacturers are now experimenting on processes in which it is admixed with other materials. The life of bauxite- brick linings is as yet undetermined, though it is known to exceed by far the life of silica or fire-clay brick. The high cost of raw material, as well as that of its manufacture, makes the ultimate cost of bauxite brick excessive as compared with that of the other two bricks mentioned.

PRODUCTION.

Alabama showed the greatest individual gain among the States, both as to quantity and value of product.

*Production of bauxite in the United States, 1889-1910, by States,
in long tons.*

Year.	Georgia.	Alabama.	Arkansas.	Total.	Value.
1889	728 .....	.....	.....	728	\$2,366
1890	1,844 .....	.....	.....	1,844	6,012
1891	3,301	292 .....	.....	3,593	11,675
1892	5,110	5,408 .....	.....	10,518	34,183
1893	2,415	6,764 .....	.....	9,179	29,597
1894	2,050	9,016 .....	.....	11,066	35,818
1895	3,756	13,313 .....	.....	17,069	44,000
1896	7,313	11,051 .....	.....	18,364	47,338
1897	7,507	13,083 .....	.....	20,590	57,652
1898 .....	.....	.....	.....	25,149	75,437
1899	15,736	14,499	5,045	35,280	125,598
1900	19,739 .....	.....	3,445	23,184	89,676
1901	18,038 .....	.....	867	18,905	79,914
1902	22,677 .....	.....	4,645	27,322	120,366
1903	22,374 .....	.....	25,713	48,087	171,306
1904	21,913 .....	.....	25,748	47,661	235,704
1905	15,173 .....	.....	32,956	48,129	240,292
1906	25,035 .....	.....	50,267	75,332	368,311
1907 .....	.....	.....	.....	97,776	480,830
1908	14,464 .....	.....	37,703	52,167	263,968
1909	22,227 .....	.....	106,874	129,101	679,447
1910	33,096 .....	.....	115,836	148,932	716,258

Production and value of Bauxite in Alabama in 1910.

Quantity Tons	Value	% of Total U. S. prod.	% of Total U. S. Value
9517	\$38,068	5.31%	6.39%

CEMENT.

EUGENE A. SMITH.

PUZZOLAN OR SLAG CEMENT.

During the past four years only one establishment in Alabama has been engaged in the manufacture of slag cement, using the material from the furnaces about Birmingham. The production is included in the returns for Portland cement and cannot be given separately.

PORTLAND CEMENT.

Alabama contains large supplies of limestone, chalk, clay and shale well adapted for Portland Cement manufacture, and widely distributed throughout the state. Coal and labor are abundant and cheap, transportation facilities are excellent, and many of the best limestone and chalk localities are situated on navigable rivers, giving ready access and cheap water transportation to Galveston, New Orleans, Mobile, Charleston, and other ports of the Gulf and Atlantic Coasts. This advantage of location will be immensely increased with the opening of the Panama Canal for cement plants located in Alabama will be more than a thousand miles nearer to the Isthmus than their nearest possible competitors.

The limestones and shales of the northern part of the state lie so close to each other, and above all so close to the great coal mines which must supply the fuel, that the establishment of Portland Cement plants near the coal mines would give to this industry in Alabama the same advantages which the proximity of the iron ore, the coal, and the stone has given to the iron industry, and which has placed our state beyond competition.

As a Portland cement mixture, ready for burning, consists approximately of 75 per cent. lime carbonate and 25 per cent. of clayey matter, the material furnishing the lime carbonate is necessarily of more economic importance than that from

which the silica and alumina are derived. In consequence, a Portland cement plant is usually located in the immediate vicinity of a suitable limestone, while the clay or shale required to complete the mixture may be brought some distance.

The limestone formations in North Alabama which can supply the stone adapted for use in cement manufacture are the Trenton or Pelham limestone and the Bangor or Subcarboniferous. In close proximity to both these limestone formations are the shales of the Clinton, Subcarboniferous and Coal Measures.

At the present time there are two cement plants in North Alabama, namely the Standard Portland Cement Co., located at Leeds in Jefferson County, and the Atlantic & Gulf Portland Cement Co., located at Ragland in St. Clair County. Both of these plants make use of the hard Trenton limestone, and the Standard Cement Co., according to Burchard of the U. S. Geological Survey, uses the shale of the Clinton formation whilst the Ragland Company makes use of the shales of the Coal Measures. Up to the present time no establishment is utilizing the Bangor limestone.

In Middle Alabama the soft, chalky Cretaceous limestone of the Selma Chalk, is the material utilized by the Alabama Portland Cement Co., at Spocari, near Demopolis. The same Company makes use of residual clays overlying and derived from the weathering of the Selma Chalk. During 1910 there was no production reported from the Demopolis plant.

In Southern Alabama the St. Stephens limestone outcropping east and west across the state, furnishes excellent material for Portland Cement manufacture, using either residual clays from decomposition of the limestone, or the clays of the Grand Gulf formation which are almost everywhere in close proximity to the limestone. The Mobile Cement Co. has been for some time engaged in the building of a plant at St. Stephens, but no production has yet been reported.

List of States Producing Puzzolan Cement, and Quantity and Value of Product from 1906 to 1910.

	1906	1907	1908	1909	1910
Number of plants reporting production:					
Alabama	2	1	1	1	1
Illinois	1	1	.....	.....	.....
Kentucky	1	1	.....	.....	.....
Maryland	1	.....	.....	.....	.....
New Jersey	1	.....	.....	.....	.....
New York	1	1	.....	.....	.....
Ohio	2	2	2	2	2
Pennsylvania	1	1	1	1	1
Total	10	7	4	4	4
Production in barrels	481,224	557,252	151,451	160,646	95,951
Value of production	\$412,921	\$443,998	\$95,468	\$99,453	\$63,286

Production and Value of Cement (Including Puzzolan and Portland) in Alabama in 1910.

Kind	No. of Producers	Quantity Produced, Bbl.	Value	Percentage of Total U. S. Value
Portland & Puzzolan....	3	406 214	\$387,600	0.56%

CLAY AND CLAY PRODUCTS.

JEFFERSON MIDDLETON AND C. A. ABELE.

Clay available for the manufacture of clay products is one of the most widely spread of our minerals. Clay miners are usually also the manufacturers of the lower-grade clays, but as the higher grades of ware are reached the rule is that fewer and fewer manufacturers are also miners, until in the highest grades of ware the rule is that the manufacturer is not the miner of the clays that he uses. The figures given in the following tables represent clay that is mined and not manufactured by the miner, but is sold as clay. The clay thus sold is small in quantity compared with that consumed and includes mainly clay used for high-grade pottery, for paper making, and for refractory products.

The total quantity of clay mined in Alabama and sold as such in 1910 was 75,082 short tons, as compared with 63,408 short tons in 1909, an increase of 11,674 tons, or 18.41 per cent. The value of the clay mined in 1910 was \$38,045, a decrease from 1909 of \$2,887, or 7.05 per cent. Fire-clay showed an increase of 9,345 tons, or 20.7 per cent. in quantity, and a decrease of \$2,950, or 8.34 per cent. in value. Miscellaneous clay, including brick clay, in 1910, increased in quantity 2329 tons, or 12.7 per cent.; and in value \$63.00 or 1.12 per cent.

Quantity and Value of Clay Produced in 1910.

Kind	Quantity Produced. Tons.	Value	Avg. Value Per Ton	Percentage of Total U. S. Value
Fire Clay	54,482	\$32,395	\$0.594	1.5%
Miscellaneous Clay.....	*20,600	5,650	0.274	2.53%
Total	75,082	\$38,045	\$0.506	1.04%

*Includes brick clay; one producer.

Comparison of 1909 and 1910.

Kind	1909		1910		Increase or Decrease		
	Quantity Tons.	Value	Quantity Tons.	Value	Quantity Tons.	Value	Percent (Value.)
Fire Clay	45,137	\$35,345	54,482	\$32,395	+ 9,345	—\$2,950	—8.34%
Miscellaneous Clay	18,271	5,587	*20,600	*5,650	+ 2,329	+ 63	+1.12%
Total	63,408	\$40,932	75,082	\$38,045	+11,674	—\$2,887	—7.05%

*Includes brick clay; one producer.

CLAY-WORKING INDUSTRIES.

The total value of the clay products in 1910 was \$1,667,559, a decrease from 1909 of \$32,568, or 1.9 per cent. The value of the brick and tile and fire-proof products was \$1,645,313, or 98.66 per cent. of the total.

Value of Brick and Tile, and Potteries, 1906-1910.

ALABAMA.

Product.	1906	1907	1908	1909	1910
Brick:					
Common—					
Quantity	166,225,000	159,315,000	120,237,000	146,180,000	135,785,000
Value	\$1,046,986	\$1,004,644	\$690,963	\$799,693	\$746,961
Average per M.	\$6.30	\$6.31	\$5.75	\$5.47	\$5.50
Vitrified—					
Quantity	(*)	13,362,000	18,248,000	20,444,000	19,772,000
Value	(*)	\$183,895	\$244,084	\$262,376	\$236,516
Average per M.	\$11.62	\$13.76	\$13.38	\$12.83	\$11.96
Front—					
Quantity	(*)	(*)	(*)	(*)	(*)
Value	(*)	(*)	(*)	(*)	(*)
Average per M.	\$11.35	\$13.90	\$17.89	\$16.19	\$15.95
Fancy	(*)	(*)	(*)	(*)	(*)
Fire	\$157,147	\$170,711	\$122,354	\$196,887	\$163,672
Drain tile	\$2,285	(*)	\$2,046	(*)	\$3,773
Sewer pipe	(*)	(*)	(*)	(*)	(*)
Fireproofing	(*)	(*)	(*)	(*)	(*)
Pottery:					
Red earthenware....do....	\$2,620	\$7,530	\$15,058	\$11,886	\$3,475
Stoneware and yellow and Rockingham ware.Value	\$35,376	\$20,215	\$9,031	\$24,453	\$16,371
Miscellaneous value.....	\$444,485	\$367,414	\$476,070	\$404,822	\$493,791
Total value	\$1,638,599	\$1,754,469	\$1,559,606	\$1,700,127	\$1,667,559
Number of operating firms reporting	112	100	103	100	87
Rank of State	21	20	19	22	22

* Included in "Miscellaneous."

BRICK AND TILE.

The total number of common brick produced was 135,785 thousand, a decrease from 1909 of 10,395 thousand, or 7.11 per cent. The value was \$746,961, a decrease of \$52,736, or 6.59 per cent. The value of vitrified brick produced in 1910 was \$236,516, a decrease from 1909 of \$25,860, or 9.85 per cent. The values of common brick, vitrified brick, fire-brick, and fire-proofing decreased, while the values of front-brick, drain tile, sewer pipe, silica brick, and miscellaneous were increased. Following is a table showing the production and values for 1910, and one showing the relation of the quantities produced and the values in 1910 to those of 1909:

Brick and Tile Production in 1910.

Style	Quantity M.	Value	Average Value per M.	Percentage of Total Alabama Brick & Tile	Percentage of Total U. S. Value.
Common Brick	135,785	\$746,961	\$5.50	45.39+%	1.35%
Drain Tile		3,773		0.23 %	0.036%
Vitrified Brick or Block.....	19,772	236,516	11.96	14.37+%	2.15%
Fire Brick	10,365	163,672	15.75	9.94+%	0.90%
Miscellaneous		*494,391		30.05 %	
Total		\$1,645,313		100.00 %	1.21%

* Includes front brick, sewer pipe, fire proofing, and silica brick.

Comparison of Brick and Tile in 1909 and 1910.

	1909.			1910.			Increase or Decrease	Percent.
	Quantity M.	Value	Average Price	Quantity M.	Value	Average Price		
Common Brick	146,180	\$799,693	\$5.47	135,785	\$746,961	\$5.50	—\$52,736	— 6.59
Vitrified Brick	20,444	262,376	12.83	19,772	236,516	11.96	— 25,860	— 9.85
Drain Tile		*			3,773			
Fire Brick	14,119	196,887	13.94	10,365	163,672	15.75	— 33,215	—16.87
Miscellaneous		†403,832			‡494,391			
Total		\$1,663,788			\$1,645,313		—\$18,475	— 1.11

* Only one producer.

† Includes Front brick, Drain tile, Sewer pipe, Fire proofing and Silica brick.

‡ Includes Front brick, Sewer pipe, Fire proofing, and Silica brick.

FOTTERIES.

Alabama produces only pottery of the commoner or coarser types, red and yellow earthenware, and even this is not produced in any quantity by the nineteen active firms in 1910, most of which produced for local trade only. There was a considerable decrease in production in 1910, the decrease amounting to \$14,093, or 38.78 per cent.

Value of Pottery Products in 1910.

Kind.	Value.	Percentage of Total Alabama Potteries.	Percentage of Total U. S. Value
Red Earthen Ware	\$3,475	15.62+%	0.41%
Stoneware and Yellow and Rocking- ham Ware	*18,771	84.38—%	0.33%
Total	\$22,246	100.00 %	0.07%

* Includes miscellaneous ware.

Comparison of 1909 and 1910.

Kind.	1909	1910	Increase or Decrease.	Percent Decrease.
Red Earthen Ware	\$11,886	\$3,475	—\$8,411	—70.76%
Stoneware and Yellow and Rockingham Ware	24,453	*18,771	—5,682	—23.23%
Total	\$36,339	\$22,246	—\$14,093	—38.78%

* Includes miscellaneous ware.

COAL.

E. W. PARKER.

THE COAL FIELDS OF ALABAMA.

The Alabama coal fields form the southwestern end of the great Appalachian coal region, which extends from northern Pennsylvania to central Alabama. The coal-bearing formations narrow in Tennessee, but widen abruptly in northern Alabama and cover about 6,000 square miles in the northern half of the State. There are four distinct coal-producing basins in the State, the Coosa and the Cahaba basins and the Warrior and the Plateau fields. The first three areas mentioned derive their names from the rivers which drain them. The Plateau field includes Blount, Look-out, and Sand or Raccoon mountains.

The Coosa basin is a deep syncline forming the southeast margin of the Alabama coal fields and extending across Shelby and St. Clair counties. It is 60 miles long by 6 miles wide and contains about 350 square miles. This basin has not been thoroughly explored and the number and extent of its coal beds are not well known, but in different parts 2 to 12 beds are reported having a thickness of 3 feet or more.

The Cahaba basin is also a syncline west of the Coosa basin, to which it is parallel and from which it is separated by a

faulted anti-cline. It includes parts of St. Clair, Jefferson, Shelby, and Bibb counties. Its length is 68 miles, its average width about 6 miles, and its area 394 square miles. There are many workable beds, and the total quantity of coal in the basin is large.

The Warrior basin is separated from the Cahaba basin and Blount Mountain by Jones and Murphrees valleys. It includes all of Walker County, most of Jefferson, Tuscaloosa, and Fayette counties, and smaller parts of Blount, Cullman, Winston, and Marion counties. Its known area is estimated at 4,000 square miles. Around its western and southern margin, however, the higher rocks and coal beds pass under rocks of much later age, and have probably a considerable, and possibly a great, extent to the southwest of their visible margin.

The Warrior basin has always been the scene of the greatest mining activity and production in the State. Somewhat over one-third of the total production in the Birmingham district comes from the Pratt bed, and one-fourth comes from the Mary Lee bed. Eight or ten other beds furnish the remainder of the production.

The Plateau field embraces parts of Blount, Etowah, Dekalb, Cherokee, Marshall, and Jackson counties, and is upward of 3,000 square miles in extent. The Plateau and the Warrior fields are the southwest extension of the Cumberland plateau in Tennessee. The coal resources of the Plateau field are not well known, but they are comparatively small. There are believed to be from 4 to 6 beds that are locally workable.

From a productive point of view the most important of the coal beds in Alabama are the Pratt and the Mary Lee. These two beds, with the Blue Creek, furnish the coking coals which have made Alabama one of the important iron-making States. The Pratt bed is worked in Jefferson and Walker counties, and from it 3,931,248 short tons of coal were produced in 1909, and 4,493,451 tons in 1910. The Mary Lee also is worked in Jefferson and Walker counties, and the output from this bed amounted in 1909 to 3,276,167 short tons. In 1910 the production was 3,734,049 tons. The other beds which make important contributions to the coal production of Alabama are (1) the Blue Creek, worked in Jefferson and

Tuscaloosa counties, with a production in 1909 of 798,879 short tons, and in 1910 of 746,833 tons; (2) the Thompson, worked in Bibb and Shelby counties, whose production amounted to 678,478 short tons in 1909, and 1,330,457 tons in 1910; (3) the Black Creek, one of the most extensive beds in the State, worked in Blount, Cullman, Jefferson, Marion, Walker, and Winston counties, produced 676,908 short tons in 1909, and 766,923 tons in 1910; (4) the Brookwood, including the Milldale, worked in Tuscaloosa County, had a production in 1909 amounting to 674,661 short tons, and in 1910 to 578,453 tons; (5) the Corona, worked in Walker County, produced 514,774 short tons in 1909, and 524,046 tons in 1910; (6) the Jagger, worked in Walker County, had an output of 507,032 short tons in 1909, and 1,183,404 tons in 1910; and (7) the American, worked in Jefferson and Walker counties, which in 1909 produced 272,717 short tons, and in 1910, 297,486 tons.

The other beds to which more or less local names have been given are the Buck (Clark, Blockton, No. 1, Woodstock), Cliff, Climax, Coal City, Black Shale (Gholson), Gould, Harkness, Helena, Howard, Jefferson, Mammoth, Maylene, Montevallo, Mount Carmel, Natural Bridge, Nickel Plate, Number One, Rutilia, Warrior, and Coke (Youngblood), with a few others. Some of these are probably duplicates, two names having been applied to the same bed, but they have not been correlated.

According to the estimates prepared by Marius R. Campbell, of the United States Geological Survey, the original coal supply of Alabama when mining began was 68,903,000,000 short tons, of which 63,513,000,000 tons were in the Warrior and Plateau fields, 2,994,000,000 tons were in the Cahaba field, and 2,396,000,000 tons in the Coosa field. From this total supply of approximately 69,000,000,000 tons there had been mined at the close of 1910, 206,153,815 tons, representing an exhaustion, including waste in mining, of 309,000,000 tons, or 0.4 per cent of the total estimated supply. A more recent estimate for the Coosa field by Wm. F. Prouty, assistant to the State geologist, is 80,921,000 tons; and by Chas. Butts, of the United States Geological Survey, for the Cahaba field, is 3,200,000,000 tons.

The production of coal in Alabama in 1910 was 7.8 per cent. of the total production up to the close of the year, and 0.02 of 1 per cent. of the estimated original supply.

PRODUCTION.

Total production in 1910, 16,111,462 short tons; spot value, \$20,236, 853.

In a preliminary review of the coal-mining industry in 1910, published as a press bulletin of the U. S. Geological Survey, early in January, 1911, it was stated that Alabama's production had reached the unprecedented total of 15,000,000 short tons. Complete returns from all but a few mines whose aggregate output is less than 50,000 tons show that the preliminary figures were exceeded by a million tons, the output being 16,111,462 short tons. This unusually large tonnage (the largest previous production being 14,250,454 short tons in 1907) was due primarily to the strike in Illinois and other Western States, and secondarily to low water in Ohio and Kanawha rivers, which reduced shipments from Pennsylvania and West Virginia to Mississippi River points. The demand thus created for Alabama coal made up for the dullness in the iron market. This dullness was pronounced during almost the entire year and was still decidedly noticeable at the close of the year, with promise of continuation during 1911.

Compared with 1909, when the production amounted to 13,702,450 short tons, the output in 1910 showed an increase of 2,408,012 short tons, or 17.57 per cent. The conditions in 1910 naturally resulted in an advance in prices, and the total value increased from \$16,306,236 to \$20,236,853, a gain of \$3,930,617, or 24.10 per cent. The average price per ton in 1910 was \$1.26, against \$1.19 in 1909.

The coal mines of Alabama were practically free from strikes in 1910, there being only 25 men idle from that cause during the year. The average time lost by the 25 men was 50 days. The labor supply, although short in places, was, on the whole, satisfactory. In some parts of the State the car supply was reported the best in several years, but in other sections quite the reverse was reported.

The coal-mining industry of Alabama was marred during 1910 by two bad disasters which together cost the lives of 131 men. The first occurred on April 20 at the Mulga mine and cost 40 lives; the second was at the Palos mine, on May 5, and cost 91 lives. The number of fatalities in these two accidents was more than the total number of deaths from all causes in either 1908 or 1909. According to the report of the chief mine inspector of the State, the total number of fatal accidents in 1910 was 238, against 129 in 1909 and 108 in 1908. The death rate per thousand in 1910 was 10.7 and the number of tons mined for each life lost was 67,695; in 1909 the death rate was 6.4 and there were 106,228 tons mined for each life lost.

The number of men employed in the coal mines of Alabama in 1910 was 22,230, who worked an average of 249 days, chiefly of 10 hours. The average production per man was 725 short tons for the year and 2.91 tons for each working day.

The number of mining machines reported in 1910 was 317, and the quantity of machine-mined coal was 2,980,122 short tons, or 18.50 per cent. of the total. In 1909, 283 machines were used in the production of 2,203,619 tons, or 15.02 per cent of the total. There were 6,772,860 short tons of coal washed in 1910, yielding 5,971,305 tons of cleaned coal and 801,555 tons of refuse.

The statistics of coal production in Alabama in 1909 and 1910, with the distribution of the product for consumption, are shown in the following table:

Coal Production of Alabama in 1909 and 1910, by counties, in short tons.

1909.

County.	Loaded at mines for shipment.	Sold to local trade and used by employees.	Used at mines for steam and heat.	Made into coke	Total quantity.	Total value.	Average price per ton.
Bibb	1,227,614	5,736	104,501	392	1,338,243	\$1,791,805	\$1.34
Etowah	44,416	238	1,540	.....	46,194	59,869	1.30
Jefferson	3,873,937	106,305	247,069	2,949,581	7,176,922	8,222,061	1.15
St. Clair	336,072	1,336	16,597	.....	354,005	460,640	1.30
Shelby	489,190	3,746	31,989	.....	524,925	838,595	1.60
Tuscaloosa	648,731	9,311	44,431	304,516	1,006,989	1,158,484	1.15
Walker	2,585,006	57,749	82,538	248,483	2,973,776	3,387,988	1.14
Winston	26,578	5,700	.....	.....	32,278	48,489	1.50
Other counties*..	235,401	6,451	7,806	.....	249,658	337,464	1.35
Small mines .....	.....	460	.....	.....	460	841	1.83
Total	9,466,945	197,032	536,501	3,502,972	13,703,450	16,306,236	1.19

* Blount, Cullman, DeKalb, Jackson, and Marion.

1910.

County	Loaded at mines for shipment.	Sold local trade & used by employees	Used at mines for steam and heat	Made into coke	Total quantity.	Total value.	Av. price per ton.	Av. No. days active	Average No. of Employees.
Bibb	1,462,720	6,961	110,883	.....	1,580,564	\$2,370,919	\$1.50	261	2,666
Etowah	169,251	1,538	1,676	.....	172,465	254,798	1.48	251	388
Jefferson	4,289,536	109,377	329,777	3,570,012	8,298,702	10,247,456	1.23	255	10,832
St. Clair	411,247	2,398	14,764	.....	428,409	571,675	1.33	234	524
Shelby	450,324	3,381	34,436	.....	488,141	780,887	1.60	253	847
Tuscaloosa ..	412,144	6,842	54,498	607,735	1,081,219	1,232,495	1.14	264	1,496
Walker	3,395,104	66,561	87,118	239,696	3,788,479	4,395,910	1.16	227	4,889
Winston	16,192	250	.....	.....	16,442	25,370	1.54	156	57
Other counties* ..	237,293	8,583	10,855	.....	256,731	356,723	1.39	241	531
Small mines..	.....	310	.....	.....	310	620	2.00	.....	.....
Total ..	10,843,811	206,201	644,007	4,417,443	16,111,462	20,236,853	1.26	249	22,230

* Blount, Cullman, Dekalb, Jackson, and Marion.

In the following table is presented a statement of the production of coal, in Alabama, by counties, during the last five years, with increases and decreases in 1910 as compared with 1909:

Coal Production of Alabama, 1906-1910, by Counties, in short tons.

County.	1906	1907	1908	1909	1910	Increase (+) or decrease (-), 1910.
Bibb	1,324,656	1,297,158	1,166,548	1,338,243	1,580,564	+ 242,321
Blount	*337,848	336,308	181,062	186,261	235,456	+ 49,195
Cullman		205,015	8,880	46,194	172,465	+ 126,271
Etowah	133,660	205,015	8,880	46,194	172,465	+ 1,121,780
Jefferson	6,623,115	7,526,275	5,914,129	7,176,922	8,298,702	+ 74,404
St. Clair	256,227	283,806	193,434	354,005	428,409	- 36,784
Shelby	225,087	245,087	407,547	524,925	488,141	+ 74,230
Tuscaloosa	1,050,792	1,047,364	712,101	1,006,989	1,081,219	+ 814,703
Walker	3,062,518	3,254,919	2,941,836	2,973,776	3,788,479	- 15,836
Winston	27,076	35,333	28,408	32,278	16,442	- 42,272
Other counties and small mines	66,984	19,189	50,648	63,857	21,585	- 2,408,012
Total	13,107,963	14,250,454	11,604,593	13,703,450	16,111,462	+ \$3,930,617
Total value.	\$17,514,786	\$18,405,468	\$14,647,891	\$16,306,236	\$20,236,853	

* Includes production of Marion County.

So far as known, the earliest record of the existence of coal in Alabama was made in 1834. The first statement of production in the State is contained in the United States census report for 1840, in which year the production is given as 946 tons. The census report for 1850 does not mention any coal production for the State, and the next authentic record is contained in the census statistics of 1860, when Alabama is credited with an output of 10,200 short tons. The mines of Alabama were probably worked to a considerable extent during the Civil War, but there are no records of the actual production until 1870, for which year the United States census reports a production of 11,000 tons. Ten years later the production had increased to 323,972 short tons, but the development of the present great industry really began in

1881 and 1882, when attention was directed to the large iron deposits near the city of Birmingham, and thus the great "boom" of that city and vicinity was inaugurated. By 1885 the coal production of the State had increased to nearly 2,500,000 tons. Then followed a period of relapse and liquidation, which lasted two years, after which business settled down to a conservative and rational basis and has since developed steadily. In 1902 the coal production of the State reached a total of over 10,000,000 tons, and reached the maximum of 16,111,462 tons in 1910.

The statistics of production in Alabama from 1840 to the close of 90 are found in the following table:

Production of Coal in Alabama from 1840 to 1910, in short tons.

Year.	Quantity.	Year.	Quantity.	Year.	Quantity.	Year.	Quantity.
1840.....	946	1859.....	9,000	1878.....	224,000	1897.....	5,893,770
1841.....	1,000	1860.....	10,200	1879.....	280,000	1898.....	6,535,283
1842.....	1,000	1861.....	10,000	1880.....	323,972	1899.....	7,593,416
1843.....	1,200	1862.....	12,500	1881.....	420,000	1900.....	8,394,275
1844.....	1,200	1863.....	15,000	1882.....	896,000	1901.....	9,099,052
1845.....	1,500	1864.....	15,000	1883.....	1,568,000	1902.....	10,354,570
1846.....	1,500	1865.....	12,000	1884.....	2,240,000	1903.....	11,654,324
1847.....	2,000	1866.....	12,000	1885.....	2,492,000	1904.....	11,262,046
1848.....	2,000	1867.....	10,000	1886.....	1,800,000	1905.....	11,866,069
1849.....	2,500	1868.....	10,000	1887.....	1,950,000	1906.....	13,107,963
1850.....	2,500	1869.....	10,000	1888.....	2,900,000	1907.....	14,250,454
1851.....	3,000	1870.....	11,000	1889.....	3,572,983	1908.....	11,604,593
1852.....	3,000	1871.....	15,000	1890.....	4,090,409	1909.....	13,703,450
1853.....	4,000	1872.....	16,800	1891.....	4,759,781	1910.....	16,111,462
1854.....	4,500	1873.....	44,800	1892.....	5,529,312		
1855.....	6,000	1874.....	50,400	1893.....	5,136,935	Total..	206,153,815
1856.....	6,800	1875.....	67,200	1894.....	4,397,178		
1857.....	8,000	1876.....	112,000	1895.....	5,693,775		
1858.....	8,500	1877.....	196,000	1896.....	5,748,697		

The following table shows the rank of Alabama in 1909 and 1910, among the ten leading coal-producing states:

Rank of first ten coal-producing States in 1909 and 1910, with quantity and value of product and percentage of each.

1909.

Production.				Value.			
Rank.	State or Territory.	Quantity. (short tons)	% of total prodn.	Rank.	State or Territory.	Value.	% of total value.
1	Pennsylvania:			1	Pennsylvania:		
	Anthracite	81,070,359	17.6		Anthracite	\$149,181,587	26.9
	Bituminous	137,966,791	29.9		Bituminous	130,085,237	23.4
2	West Virginia ...	51,849,220	11.2	2	Illinois	53,522,014	9.6
3	Illinois	50,904,990	11.0	3	West Virginia ...	44,661,716	8.1
4	Ohio	27,939,641	6.1	4	Ohio	27,789,010	5.0
5	Indiana	14,834,259	3.2	5	Alabama	16,306,236	2.9
6	Alabama	13,703,450	3.0	6	Indiana	15,154,681	2.7
7	Colorado	10,716,936	2.3	7	Colorado	14,296,012	2.6
8	Kentucky	10,697,384	2.3	8	Iowa	12,793,628	2.3
9	Iowa	7,757,762	1.7	9	Kansas	10,083,384	1.8
10	Kansas	6,986,478	1.5	10	Kentucky	10,079,917	1.8

1910.

Production.				Value.			
Rank.	State or Territory.	Quantity. (short tons)	% of total prodn.	Rank.	State or Territory.	Value.	% of total value.
1	Pennsylvania:			1	Pennsylvania:		
	Anthracite	84,485,236	16.8		Anthracite	\$160,275,302	25.5
	Bituminous	150,521,526	30.0		Bituminous	153,029,510	24.3
2	West Virginia ...	61,671,019	12.3	2	West Virginia ...	56,665,061	9.0
3	Illinois	45,900,246	9.1	2	Illinois	52,405,897	8.3
4	Ohio	34,209,668	6.8	4	Ohio	35,932,288	5.7
5	Indiana	18,389,815	3.7	5	Indiana	20,813,659	3.3
6	Alabama	16,111,462	3.2	6	Alabama	20,236,853	3.2
7	Kentucky	14,623,319	2.9	7	Colorado	17,026,934	2.7
8	Colorado	11,973,736	2.4	9	Kentucky	14,406,887	2.3
9	Iowa	7,928,120	1.6	9	Iowa	13,903,913	2.2
10	Wyoming	7,533,088	1.5	10	Wyoming	11,706,187	1.9

COKE.

E. W. PARKER.

The most significant feature of the coke-making industry in Alabama, as in most of the coke-producing States in 1910, was the advance in values. The quantity of coke produced in 1910 was not materially larger than in 1909, the increase being 163,203 short tons, or 5.3 per cent, from 3,085,824 short tons to 3,249,027 short tons, but with the improved demand prices advanced from an average of \$2.61 per ton in 1909 to \$2.82 in 1910, and the total value increased from \$8,068,267 to \$9,165,821, a gain of \$1,097,554, or 13.6 per cent. In quantity the production of coke in Alabama in 1910 was the largest ever made, but the value of the 1910 product was about \$50,000 less than that of 1907.

Reference has been made in previous reports to the advantages possessed by Alabama in having in the iron-making district of Birmingham a home market for its output of coke. Until the last few years Alabama and West Virginia were close rivals for second place among the coke-producing States, Pennsylvania of course being first. Since 1905 West Virginia has outstripped Alabama in the quantity of coke produced, and in 1910 made 3,803,850 short tons of coke as compared with 3,249,027 tons made in the Alabama ovens. Little of West Virginia's coke is, however, supplied to local markets. Probably 98 per cent. is shipped out of the State to furnish fuel to distant iron furnaces. The effect is shown by comparisons that may be made between the values of Alabama and West Virginia cokes, for whereas the quantity of coke made in West Virginia in 1910 exceeded the Alabama product by 554,823 short tons, the value of Alabama's coke exceeded that of West Virginia by \$1,811,782. The average price of Alabama coke in 1910 was \$2.82; that of West Virginia was \$1.93.

Of the total quantity of coke made in 1910 in Alabama, 557,148 short tons were produced in by-product retort ovens, of which there are two establishments, with a total of 280 ovens in the State. The quantity of coal used in the retort ovens was 769,212 short tons, indicating a yield of coal in coke of 72.4 per cent. The average yield in coke made

by the beehive ovens was 59.8 per cent. During 1910 construction was begun on a bank of 60 Koppers by-product recovery ovens at Woodward by the Woodward Iron Co., and the Tennessee Coal, Iron & Railroad Co. began the construction of 280 ovens of the same type at Corey. These were the only new ovens under construction in the State at the close of the year.

There were 43 establishments in Alabama in 1910, the same number as in 1909. The total number of ovens increased from 10,061 in 1909 to 10,132 in 1910. These do not include the 340 Koppers ovens under construction at the close of 1910. Of the 43 establishments 5, with a total of 518 ovens, were idle during the entire year 1910. In 1909 there were 6 establishments with a total of 713 ovens idle throughout the year. The average production from the 9,614 ovens that were in operation in 1910 was 338 short tons; in 1909 the average production per oven was 330 tons.

The principal coal beds of Alabama which furnish the coal for coke making are the Pratt, the Mary Lee, and the Blue Creek, all of which are in the Warrior Basin, and the mining operations are in Jefferson, Walker, and Tuscaloosa counties. Some coking coal is also produced from the Buck or Blocton No. 1 bed, in Bibb County.

The production of coke in Alabama in 1880, 1890, 1900, and from 1906 to 1910 is shown in the following table:

Statistics of the manufacture of coke in Alabama, 1880-1910.

Year.	Establishments.	Ovens.		Coal used (short tons.)	Coke produced (short tons.)	Total value of coke at ovens.	Value of coke at ovens (per ton.)	Yield of coal in coke (per cent.)
		Built.	Building.					
1880.....	4	316	100	106,283	60,781	\$183,063	\$3.01	57.0
1890.....	20	4,805	371	1,809,964	1,072,942	2,589,447	2.41	59.0
1900.....	30	6,529	690	3,582,547	2,110,837	5,629,423	2.67	58.9
1906.....	42	9,731	160	5,184,597	3,034,501	8,477,899	2.79	58.5
1907.....	43	9,889	50	4,973,296	3,021,794	9,216,194	3.05	61.0
1908.....	45	10,103	0	3,875,791	2,362,666	7,196,901	3.04	61.0
1909.....	43	10,061	0	5,080,764	3,085,824	8,068,267	2.61	60.7
1910.....	43	*10,132	†340	5,272,322	3,249,027	9,165,821	2.82	61.6

* Includes 280 Semet-Solvay ovens.

† Koppers by-product ovens.

About 60 per cent of the coal made into coke in Alabama in 1910 was washed slack. The total quantity of coal made into coke in 1910 was 5,272,322 short tons, of which 3,192,306 tons were washed slack. Of the other, 2,080,016 tons, 1,308,085 tons were run-of-mine coal crushed and washed before coking, and 771,931 tons were unwashed mine-run coal. The total quantity of washed coal used was 4,500,391 short tons, or 86 per cent. of all the coal made into coke.

The character of the coal used in the manufacture of coke in Alabama in 1890, 1900, and for the last five years, is shown in the following table:

Character of coal used in the manufacture of coke in Alabama, 1890-1910, in short tons.

Year.	Run of mine.		Slack.		Total.
	Unwashed.	Washed.	Unwashed.	Washed.	
1890.....	1,480,669	0	206,106	123,189	1,809,964
1900.....	1,729,882	152,077	165,418	1,535,170	3,582,547
1906.....	1,493,549	1,810,089	121,122	1,759,837	5,184,597
1907.....	1,020,907	1,697,913	27,433	2,227,043	4,973,296
1908.....	548,093	1,457,360	53,218	1,817,120	3,875,791
1909.....	713,992	2,153,801	0	2,212,971	5,080,764
1910.....	771,931	1,308,085	0	3,192,306	5,272,322

Below is a list showing the rank of the first five of the States producing coke in 1906-1910.

Rank of the first five States in production of coke, 1906-1910.

State or Territory	1906	1907	1908	1909	1910
Pennsylvania	1	1	1	1	1
West Virginia	2	2	2	2	2
Alabama	3	3	3	3	3
Illinois	14	10	9	5	4
Virginia	4	4	4	4	5

*Comparison of production and value of coke in Alabama.
1909 and 1910.*

	No. of Ovens.	Coal Charged short tons	Coke Produced short tons	Total value of Coke at Ovens.	Percent. of total U.S.value
1909	10,061	5,080,764	3,085,824	\$8,068,267	8.97%
1910	10,132	5,272,322	3,249,027	\$9,165,821	9.19%
Increase	71	191,551	163,203	\$1,097,554	
Percentage Increase..	.705%	3.77%	5.26%	13.60%	

GOLD AND SILVER.

H. D. M'CASKEY.

The mine production of gold in Alabama in 1910 was 1,622.16 fine ounces, valued at \$33,533, and that of silver was 268 fine ounces, valued at \$145. These figures show an increase in value of gold output for Alabama of \$4,294, and an increase in silver output of 56 fine ounces in quantity and of \$35 in value. The silver production is entirely from recovery of this metal in refining the gold. No copper ores were mined in 1910.

The production of gold and silver in Alabama in 1910 was reported from 3 deep mines and 3 gold placers. The total placer gold, all from Mud and Clear creeks, in Cleburne County, was valued at \$357 in 1910, as against \$69 in 1909. The deep-mine production was from 9,763 short tons of ore, with an average recoverable value per ton in gold and silver of \$3.41. In 1909 the ore production was 9,886 short tons, but the recoverable value per ton was only \$2.96.

The output in 1910 was again almost wholly from the Hog Mountain mines in Tallapoosa County. The siliceous ores of this mine are in part oxidized and in part sulphides, and they are treated in a 120-ton cyanide plant. There was a nominal output of gold from the Gold Ridge mines in Randolph County, and development work at the Story pros-

pect in Talladega County yielded a small amount of siliceous smelting ore which was shipped. Dump material was also treated at this property by amalgamation in a 5-stamp mill. Operations continued for only three months in 1910. Development work was done at the Holly mines near Dadeville in Tallapoosa County.

Gold and Silver production in 1909 and 1910.

	Gold.		Silver.		
	Value.	Percentage of total U. S. Value	Quantity oz.	Value.	Percentage of total U. S. Value
1909	\$29,239	0.029%	212	\$110	0.00035%
1910	33,533	0.035%	268	145	0.00046%
Increase	4,294		56	35	
Percentage	14.68%		26.37%	31.82%	

GRAPHITE.

EUGENE A. SMITH.

This substance is very generally distributed among the metamorphic or crystalline rocks, and it occurs in two modes. In the feebly crystalline schists or slates which we have called the Talladega, and which in part, at least, are paleozoic sediments, of as late age as the Coal Measures, the graphite is very often found as a sort of black graphitic clay free from grit and is frequently used as a lubricant. In this condition the graphite is very difficult to separate from the other matters with which it is mixed. Examples of this mode of occurrence are to be seen near Millerville, in Clay County, and about Blue Hill and Gregory Hill in Tallapoosa.

In the mica schists and other fully crystalline rocks of this region the graphite is present in the form of thin flakes, or *lamellae*, and is comparatively easy to separate from the enclosing rock. This variety of graphite has been worked at several points in Clay, Coosa, and Chilton Counties.

In Tallapoosa County a mile below Tallassee there is a third mode of occurrence, or perhaps a modification of the second

above described. Here a belt of garnetiferous schist crosses the river in an outcrop of about 100 yards width. In this schist the graphite is found in lenses or flakes which sometimes attain a diameter of two inches. As the rock disintegrates the graphite lenses weather out and are scattered loose over the surface. The same belt or a similar one is to be seen where it crosses Wolf Creek in the northern part of Macon County.

During 1910 only two companies produced graphite in Alabama, viz.: (1) The Allen Graphite Co., whose plant is located about eight miles west of Ashland at "Graphite." (This Company was acquired in 1911 by the Quenelda Graphite Co.) (2) The Ashland Graphite Co., successor to the Enitachopco Graphite Co., whose quarry and mill are located about 4 1-2 miles west of Ashland. The graphite bearing rock at both places is a much decomposed schist consisting mainly of quartz and graphite. The character of the original rock is very difficult to determine.

This belt of graphitic schist can be followed southwestward through Coosa into Chilton County. Very promising occurrences have been noted in the vicinity of Goodwater and Hollins and near the Coosa River about Dollar P. O. in Coosa County, and across the river in Chilton County at one or two localities near Mountain Creek on the L. & N. R. R. In former years the Dixie Graphite Co. and the Flaketown Graphite Co. in this section were credited with some production of graphite, but they were idle during 1910.

In the Mineral Resources of the United States Geological Survey for the year 1910 a full account by Mr. Edson S. Bastin is given of the graphite producing plants in Clay County, together with rather full notices of the Dixie and Flaketown companies. To this article the reader who is interested in the possibilities of Alabama in this particular is referred.

Production and Value of Crystalline Graphite in Alabama in 1910.

Quantity.	Value.	Percent of total U. S. Production	Percent of total U. S. Value.
1,577,997 lbs.	\$54,688	2.03%	14.49

IRON ORE.

EUGENE A. SMITH.

Iron ores of Alabama in the order of their economic importance are (1) red ore or hematite; (2) the brown ore or limonite; (3) the gray ore. The black band and clay iron stone have been noticed as occurring in a number of places, but only the red ore and the brown ore have been mined on any large scale.

Practically all the ore mined in Alabama is smelted in the State, the shipments out of the State being about equal to those received from other states.

The tables given below will show the rank of Alabama among the States of the Union both in the production of iron ore and in pig iron, and will show also the quantity of iron produced by charcoal and by coke respectively as fuels.

RED ORE OR HEMATITE.

Practically all the ore of this quality mined in Alabama occurs in the Clinton or Red Mountain formation. The Red Mountain ridges occur on each side of the anticlinal valleys which separate the coal fields. In places the red ore ridges are lacking on one side, usually the western, of the valleys being cut out by faults, while on the other hand the ridge may be duplicated on one side of the valley by the same faults.

In most of the valley occurrences the moderate dips of the ore bed are on the eastern side and there are also practically all of the ore mines. Murphrees Valley makes an exception to this, the moderate dips and the iron mines being on the western side. The iron ore occurs mainly in the central part of the formation in seams or beds one to five in number, which vary in thickness from a few inches to thirty feet.

While the ore seams are very persistent along the outcrop which in Alabama must be as much as 50 miles, yet they vary

greatly from place to place, being either too thin or too lean for profitable working in the greater part of this distance.

The most important development of the Clinton ore in this State and in the world is along the 15 or 16 mile stretch of the east Red Mountain between Birmingham and Bessemer, and there is a practically continuous series of mines and strip-pings for this entire distance. Much mining of this ore has also been done near Gate City, Village Springs, Attalla, Gadsden, Round Mountain, Gaylesville, Ft. Payne, Valley Head, etc.

Production and Value of Hematite in Alabama in 1909 and 1910.

	Quantity. Tons.	% of total U.S. Prod.	Value.	% of total U.S. Value
1909	3,176,416	6.87%	\$3,389,206	3.38%
1910	3,678,139	7.12%	4,376,555	3.39%
Increase	501,723		987,349	
Percent.	15.79%		29.13%	

The average price per long ton of hematite ore in Alabama was, in 1909, \$1.07; in 1910, \$1.19.

BROWN ORE OR LIMONITE.

This ore, the second in importance in the State and in the United States, furnished only 5.04 per cent of the total iron ore production of the United States in 1910. Of this Alabama produced 39.15 per cent., 1,123,136 long tons, and the State holds the *first* rank in this industry.

In the early days of iron making and up to the year 1876 this was the only ore used in the catalan forges, bloomaries, and charcoal furnaces of the State. It was then demonstrated that good iron could be made at low cost from the red ores, with coke for the fuel.

In general the limonites are considered the best of the ores of Alabama and they command the highest prices and command a ready sale.

The usual mode of occurrence is in irregular masses of concretionary origin in the residual clays resulting from the decomposition of limestones, and as a consequence the mining is uncertain and expensive. Limonite also occurs in regu-

larly stratified seams or beds, and then it is the result of the alteration of pyrites or of carbonate ores. Practically all of the brown ore actually mined is that occurring in the residual clays above mentioned. Most of the ore before going to the furnace is washed and screened, and this manipulation, together with the cost of mining, makes it the most expensive of the iron ores, and it is therefore seldom used alone, but is usually mixed with the red ore in proportions determined by the quality of the iron desired. It is used alone in the charcoal furnaces and also in the coke furnaces when a particularly tough pig iron is wanted.

The limonite deposits are very numerous and are distributed over a broad expanse of country and in many places are known to be very extensive. In some of the deposits the ore is in nearly solid mass, in others it is much scattered, and in consequence the amount of foreign material necessary to be moved for every ton of ore produced, varies very much, not only in the different ore banks but also in the different parts of the same bank.

The deposits occur in nearly all the geological formations of the state, but in most of these the ore is either insufficient in quantity or not pure enough to be of much commercial value. The most important of the deposits, in point of extent and value, occur overlying the following formations, viz., the Knox Dolomite and the Weisner Quartzite, the Lauderdale Chert of the Lower Carboniferous, and the Lafayette. Some extensive beds of ore of inferior quality generally, occur also in the Tuscaloosa formation of the Cretaceous, and in the upper part of the Lower Carboniferous and in the Metamorphic rocks.

The average price per long ton of limonite in Alabama was in 1909, \$1.41; in 1910, \$1.53.

Production and Value of Brown Ore in Alabama in 1909 and 1910.

	Quantity.	% of total U.S. Prod.	Value.	% of total U.S. Value
1909	1,144,836	42.39%	\$1,607,249	35.43%
1910	1,123,136	39.15%	1,707,167	35.28%
Increase or Decrease	-21,700		+\$99,918	
Percent	-1.88%		+6.21%	

In the following table the States are arranged according to their rank as producers in 1909 and 1910, with regard to both the quantity and the value of the iron ore produced:

Rank of first five iron-ore producing States in 1909 and 1910, with quantity and value of product and percentage of each.

1909.

Rank	State.	Production.		Rank	State.	Value.	
		Quantity, in long tons.	Percentage of total product'n			Amount.	Percentage of total value.
1	Minnesota	28,975,149	56.64	1	Minnesota	\$60,253,314	54.79
2	Michigan	11,900,384	23.26	2	Michigan	32,282,622	29.36
3	Alabama	4,321,252	8.45	3	Alabama	4,996,455	4.54
4	Wisconsin	1,067,436	2.09	4	New York	3,072,323	2.79
5	New York	1,015,333	1.98	5	Wisconsin	2,727,406	2.48

1910.

1	Minnesota	31,966,769	56.19	1	Minnesota	\$78,462,560	55.75
2	Michigan	13,303,906	23.39	2	Michigan	41,393,585	29.41
3	Alabama	4,801,275	8.44	3	Alabama	6,083,722	4.32
4	New York	1,287,209	2.26	4	New York	3,848,683	2.74
5	Wisconsin	1,149,551	2.02	5	Wisconsin	3,610,349	2.57

Production of Iron Ore in Alabama in 1909 and 1910.

	Hematite (long tons)	Low ore (long tons)	Total Quantity.	Value.	% of total U. S. Value.
1909	3,176,416	1,144,836	4,321,252	\$4,996,455	4.54
1910	3,678,139	1,123,136	4,801,275	\$6,083,722	4.32
Increase or Decrease ...	+501,723	-21,700	+480,023	+\$1,087,267	
Per cent	+15.79	-1.89	+11.11	+21.67	

Kinds of Ore Produced in Alabama, and Values of same in 1909 and 1910.

	Hematite			Brown Oore			Total.		Percent of U. S. Total
	Quantity long tons	% of total	Value	Quantity long tons	% of total	Value	Quantity long tons	Value	
1909	3,176,416	73.73	\$3,389,206	1,144,836	26.26	\$1,607,249	4,321,252	\$4,996,455	8.44
1910	3,678,139	76.6+	\$4,376,555	1,123,136	23.39+	\$1,707,167	4,801,275	\$6,083,722	8.43
Increase or Decrease	+501,723		+\$987,349	-21,700		+\$89,918	+480,023	+\$1,087,267	
Per cent	+15.79%		+29.13%	-1.88%		+6.21%	+11.11%	+21.76%	

*Rank of Groups producing over 50,000 Tons.
(Alabama Mines.)*

	Name of Mine.	Nearest Town	Variety of ore	Quantity.
1	Red Mountain Group..	Bessemer	Hematite	1,769,067
2	Woodward	Woodward	Hematite	456,959
3	Songo	Birmingham	Hematite	189,527
4	Crudup	Gadsden	Hematite	164,250
5	Greeley	Greeley	Brown Ore	145,210
6	Woodstock	Woodstock	Brown Ore	127,647
7	Raimund No. 1	Bessemer	Hematite	118,675
8	Raimund No. 2	Bessemer	Hematite	100,741
9	Steinman	Birmingham	Hematite	78,557
10	Houston	Woodstock	Brown Ore	75,554
11	Champion	Oneonta	Brown Ore	67,024
12	Spalding	Birmingham	Hematite	58,750
13	Stegmiller	Birmingham	Hematite	54,403
14	Tecumseh	Tecumseh	Brown Ore	50,964
			Total	3,457,318

PIG IRON AND STEEL.

The following table shows the quantity and approximate value of pig iron production in the United States in 1909 and 1910, and the increase or decrease, both by totals and percentages, for the first five producing States:

Quantity and value of pig iron produced in the United States in 1909 and 1910 by first five States, in long tons.

State	1909		1910		Increase (+) decrease (—) in 1910.		Percentage increase (+) or decrease (—) in 1910.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value
1 Penn'a. ...	10,918,824	\$175,429,000	11,272,323	\$180,695,338	+353,499	+\$5,266,338	+ 3.24	+ 3.00
2 Ohio	5,551,545	93,321,000	5,752,112	88,122,356	+200,567	— 5,198,644	+ 3.61	— 5.57
3 Illinois	2,467,156	44,211,000	2,675,646	42,917,362	+208,490	— 1,293,638	+ 8.45	— 2.93
4 Alabama .	1,763,617	22,222,000	1,939,147	23,754,551	+175,530	+ 1,532,551	+ 9.95	+ 6.90
5 New York	1,733,675	27,392,000	1,938,407	32,410,165	+204,732	+ 5,018,165	+11.81	+18.32

*Production of pig iron in Alabama, 1907-1910.**J. M. Swank.*

	Coke Pig Iron Long tons	Charcoal Pig Iron Long tons	Total Long tons
1907	1,651,533	35,141	1,686,725
1908	1,373,199	23,815	1,397,014
1909	1,729,976	33,641	1,763,617
1910	1,903,443	35,704	1,939,147
1911	1,679,886	32,557	1,712,443

*Alabama Production of Rolled Iron and Steel (including Rolled Forging Blooms and Rolled Forging Billets) from 1907 to 1910 inclusive.**J. M. Swank.*

Year.	Iron	Steel	Total
1907	44,728	238,569	283,297
1908	4,417	269,235	273,652
1909	1,267	256,705	257,972
1910	6,419	420,052	426,471

LIME.

C. A. ABELE.

The total production of fourteen operators in 1910 was 81,696 short tons, an increase over 1909 of 6,428 tons or 8.54 per cent. The value of the product was \$303,612, an increase of 13,553, or 4.67 per cent.

Production and value of lime in 1909 and 1910, and a comparison of these years:

Production of Lime in 1909 and 1910.

	No. of Operators.	Quantity Short tons	Value.	Av'g price per ton.	Percentage of total U. S. Value.
1909	16	75,268	\$290,059	\$3.85	2.08%
1910	14	81,696	\$303,612	\$3.72	2.19%
Increase		6,428	\$13,553		
Percentage		8.54%	4.67%		

The most important use of the lime produced in this State is for building purposes, though a large percentage is used in chemical plants, sugar refineries, etc., or is handled by dealers. Though at present only a small part of the Alabama production is used in chemical processes, this use may in time create a greater market in this State.

Below is an outline of some of the chemical processes in which lime may be used.

Chemical Uses of Lime.

E. F. Burchard.

Agricultural industry:	Miscellaneous manufactures:
As a soil amendment, c, m. ³	Rubber, c, m.
As an insecticide, c, m.	Glue, c, m.
As a fungicide, c, m.	Pottery and porcelain, c, m.,
Bleaching industry:	Dyeing fabrics, c, m.
Manufacture of bleaching powder,	Polishing material c, m.
"Chloride of lime," c.	Oil, fat, and soap manufacture:
Bleaching and renovating of rags,	Manufacture of soap, c.
jute, ramie, and various paper	Manufacture of glycerine, c.
stocks, c, m.	Manufacture of candles, c.
Caustic alkali industry:	Renovating fats, greases, tallow,
Manufacture of soda, potash and	butter, c, m.
ammonia, c.	Removing the acidity of oils and
Chemical industries:	petroleum, c, m.
Manufacture of ammonia, c.	Lubricating greases, c, m.
Manufacture of calcium carbide,	Paint and varnish manufacture:
calcium cyanimid and calcium	Cold-water paint, c, m.
nitrate, c.	Refining linseed oil, c, m.
Manufacture of potassium dich-	Manufacture of linoleum, c, m
romate and sodium dichromate,	Manufacture of varnish, c, m.
c.	Paper industry:
Manufacture of fertilizers, c, m.	Soda method, c.
Manufacture of magnesia, m.	Sulphite method, m.
Manufacture of acetate of lime, c.	For strawboard, c, m.
Manufacture of wood alcohol, c.	As a filler, c, m.
Manufacture of bone ash, c, m.	Preserving industry:
Manufacture of calcium carbides,	Preserving eggs, c.
c.	Sanitation:
Manufacture of calcium light	As a disinfectant and deodorizer,
pencils, c.	c.
In refining mercury, c.	Purification of water for cities,c.
In dehydrating alcohol, c.	Purification of sewage, c.
In distillation of wood, c.	Smelting industry:
Gas manufacture:	Reduction of iron ores, c, m.
Purification of coal gas and water	Sugar manufacture:
gas, c, m.	Beet root, c.
Glass manufacture:	Molasses, c.
Most varieties of glass and	Tanning industry:
glazes, c.	Tanning cowhides, c.
Milling industry:	Tanning goat and kid hides, c, m.
Clarifying grain, c, m.	Water softening and purifying, c.

³ High calcium lime is indicated by "c," magnesian and dolomitic lime by "m."

MINERAL WATERS.

G. C. MATSON.

According to the returns received from spring owners, the mineral-water trade of Alabama continued to prosper during 1910, sales increasing from 116,645 gallons reported during 1909 to 133,159 gallons in 1910, an increase of 16,514 gallons, or a little over 14 per cent. The value, however, owing to a decline of 2 cents per gallon in the average price for the year, increased only 7 per cent, or from \$28,595 in 1909 to \$30,639 in 1910. There were no new springs reporting during 1910, and one which sold a considerable quantity during 1909 changed ownership during the year and could not furnish data, thus decreasing the total number of springs from 10 to 9. About three-fourths of the total sales of mineral water in Alabama is used medicinally. There are resorts at 6 of the springs, accommodating more than 1,000 people, and the water at 3 is said to be used for bathing purposes. In addition to the quantity reported as sold, there were 10,500 gallons used for the manufacture of soft drinks.

The following list of 9 springs reported sales:

Bailey Springs, Florence, Lauderdale County.
Bromberg Gulf Coast Lithia Springs, Bayou La Batre, Mobile County.
Healing Springs, Healing Springs, Washington County.
Ingram Lithia Wells, near Ohatchee, Calhoun County.
Livingston Mineral Springs, Livingston, Sumter County.
Luverne Mineral Spring, Luverne, Crenshaw County.
MacGregor Springs, Spring Hill, Mobile County.
Magnolia Spring, Magnolia Springs, Baldwin County.
Matchless Mineral Wells, east of Greenville, Butler County.

The following table shows the increase in the value of the mineral waters produced in 1910, over the value of those produced in 1909.

Production of Mineral Waters in 1909 and 1910.

	No. of Springs.	Quantity Sold (gal.)	Average retail price.	Value of Medicinal Waters.	Value of Table Waters.	Total Value of Mineral Waters.	Percentage of Total U. S. Value.
1909	10	116,645	\$0.25	\$21,208	\$7,387	\$28,595	0.41%
1910	9	133,159	\$0.23	\$23,179	\$7,460	\$30,639	0.48%
Increase		16,514		\$ 1,971	\$ 73	\$ 2,044	
Percentage		14.15%		9.29%	0.99%	7.15%	

Since 1910 a number of other Mineral waters have been reported and will be taken into account in the statistics of 1911 and following years.

SAND AND GRAVEL.

C. A. ABELE.

The total production of sand and gravel in the State in 1910 was 307,715 short tons, valued at \$100,261, as compared with 307,456 short tons, valued at \$109,478 in 1909, a net increase in quantity of 259 short tons, or .084 per cent., and a decrease in value of \$9,217, or 8.42 per cent.

The following tables give the production, value, and uses of the sand and gravel in 1909 and 1910, and a comparison of these years:

Production and Value of Sand in 1909 and 1910.

	Molding Sand		Building Sand		Engine Sand		Furnace Sand		Other Sand		Total	
	Quan- tity tons	Value	Quan- tity tons	Value	Quan- tity tons	Value	Quan- tity tons	Value	Quan- tity tons	Value	Quan- tity tons	Value
1909	119,999	\$57,236	169,567	\$49,249	6,510	\$1,993	100	\$50	1,280	\$950	307,456	\$109,478
1910	56,085	22,069	228,797	73,567	6,350	1,930	286	148	16,197	2,547	307,715	100,261
Increase or												
Decrease	-63,914	-35,237	+59,230	+14,318	-160	-63	+186	+98	+14,917	+1,397	+259	-9,217
Per cent	-53.26	-61.54	+35.52	+29.08	-2.46	-0.34	+186.0	+196.	+1,173.2	+147.05	+0.084	-8.42

Production and Value of Sand and Gravel in 1909 and 1910.

	Gravel		Sand		Total		% of Total U. S. Value
	Quan- tity tons	Value	Quan- tity tons	Value	Quan- tity tons	Value	
1909	314,322	\$104,918	307,456	\$109,478	621,778	\$214,396	1.16%
1910	311,538	87,330	307,715	100,261	619,253	187,591	.89%
Increase or							
Decrease	-2,774	-17,588	+259	-9,217	-2,525	-26,805	.....
Per cent	-0.88	-16.76	+0.084	-8.42	-0.406	-12.5	.....

STONE.

E. F. BURCHARD.

The figures presented in the following report have to do with the stone produced and sold by the quarrymen and include only such manufactured product as is put on the market by the quarrymen themselves. This applies especially to rough and dressed building stone, dressed monumental stone, crushed stone, flagstone, curbstone, and paving blocks. The value given to this manufactured product is the price received by the producer, free on board at point of shipment, and includes therefore the cost of labor necessary to dress the stone. The stone reported as sold rough includes stone sold as rough stock to monumental works, and to cut-stone contractors for building purposes; stone sold as riprap, rubble, and flux; and includes the value of only such labor as is required to get the stone out of the quarry in the shape required by the purchaser. The value given to this stone is the price received by the quarryman free on board at point of shipment. In case the stone is sold to local trade the value is given as the quarryman sells the material, generally at the quarry, but in some cases delivered, if this is done by the producer. In some instances a long haul to market or to the railroad in-

creases the cost of the material, and therefore of the selling price.

UNIT OF MEASUREMENT.

Owing to the variety of uses to which stone is put there is no regular unit of measurement employed by the quarrymen, the stone being sold by the cubic yard, the cubic foot, the ton, cord, perch, rod, square foot, square yard, square, etc. Building and monumental stone, especially the dressed product, is usually sold by the cubic foot or the cubic yard, although this unit varies with the class of stone and with the locality; a large quantity of the rough stone is sold by the perch, cord and ton. Rubble and riprap, including stone for heavy masonry, such as breakwater and jetty work, are generally sold by the cord and ton. Fluxing stone and stone for chemical use—as for alkali works, sugar factories, carbonic-acid plants, paper mills, etc.—are sold by the long ton. Flagstone and curbstone are sold by the square yard and the square foot, the thickness being variable and depending on the order received by the quarrymen. Paving blocks are sold invariably by number of blocks, and as such have been tabulated and published for several years; these blocks, however, are not of uniform size, the value depending on the size and amount of labor necessary to cut the block into the shape desired. Crushed stone is reported as sold by the cubic yard or ton, the short ton being more generally used. The weight of a cubic yard varies from 2,300 to 3,000 pounds, the average weight being 2,500 pounds. In certain localities this crushed stone is sold by the "square" of 100 square feet by 1 foot, or 100 cubic feet to a square. It is also of interest to note the selling of crushed stone by the bushel, 21 1-2 bushels representing a cubic yard of about 2,700 pounds. As most of the crushed-stone producers report the quantity according to some unit, it has been possible to convert the crushed stone into short tons, which unit represents the larger number of producers and is the most convenient.

LIMESTONE.

This report does not include the value of the stone burned into lime, nor of that used in the manufacture of Portland cement. The former values are given under the heading, Lime; the latter are included in the value of the cement.

As thus limited the total value of limestone produced in 1910 was \$714,516, as compared with \$700,642 in 1909, an increase of \$13,874.

The values from 1906 to 1910 are given below for comparison.

1906	1907	1908	1909	1910
\$579,344	\$694,699	\$479,730	\$700,642	\$714,516

The values of limestone produced in 1909 and 1910, classified according to the uses may be seen in the following table:

Values of Limestone Produced in 1909 and 1910.

	1909	1910	Increase or Decrease	Per cent
Rough Building	\$ 775	\$ 1,901	\$ +1,126	+145.29%
Dressed Building	27,197	34,001	+6,804	+25.01%
Paving	2,000	4,500	+2,500	+125.00%
Curbing	46,115	.....	.....	.....
Rubble	8,460	.....	.....	.....
Riprap	19,200	37,505	+18,305	+95.34%
Road Making	60,452	64,872	+4,420	+7.24%
Railroad Ballast	5,521	5,842	+321	+5.81%
Concrete	16,825	16,199	-626	-3.72%
Flux	512,585	545,988	+33,403	+6.51%
Other	*1,512	3,708	+2,196	.....
Total	\$700,642	\$714,516	+\$13,874	+1.98%
Percentage of total U. S. value	2.18	2.62	.....	.....

* Includes limestone for agricultural purposes.

LIMESTONE FOR BUILDING PURPOSES.

EUGENE A. SMITH.

From the tables above it will be seen that by far the largest part of the limestone for other purposes than lime burning produced in Alabama 1909-1910, has been for flux rock in the iron furnaces. Crushed stone for road making and riprap follow next, and then dressed building stone.

The preparation of cut stone for building purposes in Alabama, while on the increase, is not yet what it should be. Practically all of this material comes from the quarries in the Subcarboniferous limestone of the Tennessee Valley, the most important quarries being at Rockwood in Franklin County, operated by Foster-Creighton-Gould Co., of Nashville. This stone is quite similar in appearance, composition, and other qualities to the Indiana stone, and so far as experience in the use of the stone from the two localities in the buildings of the University of Alabama goes, the Alabama stone holds its own under influence of the weather better than does the Indiana stone. Stone steps, door sills, and window sills, buttress caps, etc., of the Alabama stone put in place in 1885 show practically no deterioration in color and wear under foot, and in crumbling and roughening under the influence of the weather, which can not be said of some portions of the Indiana stone used in buildings erected in 1909-10. The Rockwood quarries have most modern and approved methods of machinery for sawing the stone and handling it in transit to the mills and elsewhere. The stone is of massive formation, of great thickness and extent. Blocks weighing as much as 25 tons, without crack or flaw, are not infrequently quarried, the size of the blocks being practically limited only by the capacity of the hoisting machinery.

The Oolitic variety is most extensively used for building and monumental work. It is of light gray color, uniform grain, and homogeneous texture. It possesses a quality of cheapness, it can be cut to any design required, and is at the same time strong and durable.

At the present time the business at this quarry is confined to the furnishing of rough and sawed stone to the cut stone contractor or dealer.

With the installing of adequate machinery at the quarry for doing the finished work, there should never be any longer any reason for going outside of the State for this quality of stone. Already the material has been very extensively used in public buildings in Mississippi, Tennessee, as well as in Alabama. The only reason why it was not used in the recently erected buildings at the University of Alabama was that at the time these building contracts were let, the quarries furnished only the rough sawn stone and there was not in Alabama any establishment adequately equipped for the dressing of the stone in the quantity needed.

MARBLE.

EUGENE A. SMITH.

The marble of Alabama is of two kinds, crystalline or true marble and non-crystalline.

The crystalline or statuary marble occurs mainly in a narrow valley along the western border of the metamorphic area, extending from Marble Valley in Coosa County, through Talladega into Calhoun. The outcrops have a width of about a quarter of a mile and a length of 60 miles at least.

The best of these occurrences as yet known are in Talladega County and the principal quarries from which the stone has been obtained are Gantt's and Herd's near Sylacauga, Nix's near Sycamore, and Taylor's and McKenzie's near Taylor's Mill east of Talladega. From all these marble was quarried before the Civil War. The only establishment actually producing marble in 1910 was the Alabama Marble Co. at Gantt's a few miles southwest of Sylacauga. This establishment has a plant with a capacity of something over 200,000 cubic feet per year, and its marble has been used in more than 140 important buildings throughout the United States. The marble

from this place is now well established as a material fully equal if not superior to the imported Italian marbles. It can be seen in the new National Museum in Washington. The mill was destroyed by fire in 1910, but has since been rebuilt on a larger scale.

The Talladega Marble Company with quarries near Taylor's Mill, was idle in 1910, but preparations are in progress for starting up the quarries soon.

Mr. Bishop, near Marble Valley south of Talladega Springs has recently exposed a fine body of marble, and expects soon to begin operations. The Scott Brothers near the old Nix Quarry not far from Sycamore, have also exposed a fine body and have many drill cores proving the superior quality of the marble as well as its very considerable thickness.

A beautiful quality of variegated limestone or marble—red, pink, and white—belonging probably to the Cambrian formation, occurs in Shelby County a mile or two south of Shelby Springs station on the L. & N. railroad, and extending thence southwest for a mile or two. Nothing but prospecting work has been done on this marble. The Trenton limestone in the Appalachian valleys, particularly Jones Valley below Bessemer, contains marble quarried in the vicinity of Knoxville. Also at Pratt's ferry on the Cahaba River in Bibb County a quarry was for many years worked in this formation and turned out a very beautiful quality of marble varying in color from gray through pink, red, and brown shades.

In the Coastal Plain the St. Stephens limestone of the Tertiary holds ledges of hard, almost crystalline rock capable of taking good polish. The colors vary from nearly white, through shades of yellowish into red, and it would make a handsome decorative marble, especially for inside work.

Other limestone formations, such as the Subcarboniferous and the Knox Dolomite, could in places be drawn upon for marble.

SANDSTONE.

The value of the sandstone produced in Alabama from 1906 to 1910 is shown below, the increase in 1910 over 1909 being \$31,736.

Value of Sandstone production from 1906 to 1910.

1906	1907	1908	1909	1910
\$40,467	\$48,673	\$34,099	\$77,327	\$109,063

Value and Uses of Sandstone Produced in 1909 and 1910.

	Rough Building	Ganister	Rubble	Riprap	Concrete	Other	Total	% of Total Value.
1909	\$ 3,951	.....	\$15,347	\$325	\$51,432	*\$6,272	\$77,327	0.96%
1910	100	\$12,088	20,802	20,073	56,000	.....	109,063	1.37%
Increase or Decrease	-3,851	.....	+5,455	+19,748	+4,568	.....	+31,736	.....
Per cent	-96.2%	.....	+35.54%	+607.62%	+8.88	.....	+40.78	.....

* Includes dressed building stone (one producer.)

FUTURE PROBABLE PRODUCTION.

The following minerals have been produced in Alabama in past years, but no production was reported for 1910; Fullers Earth, Manganese ore, Mica, Ocher, Pyrite. Since all these occur in quantity and of quality to make them of commercial value, the production may be resumed at any time.

Among the probable productions in the near future, are natural gas and petroleum, onyx marble, turquoise and other minerals noticed in the Index to the Mineral Resources of Alabama a publication of the State Geological Survey.

Natural gas under pressure of 630 pounds has been obtained from several wells in Fayette County, and smaller quantities under less pressure have been obtained near Huntsville and elsewhere.

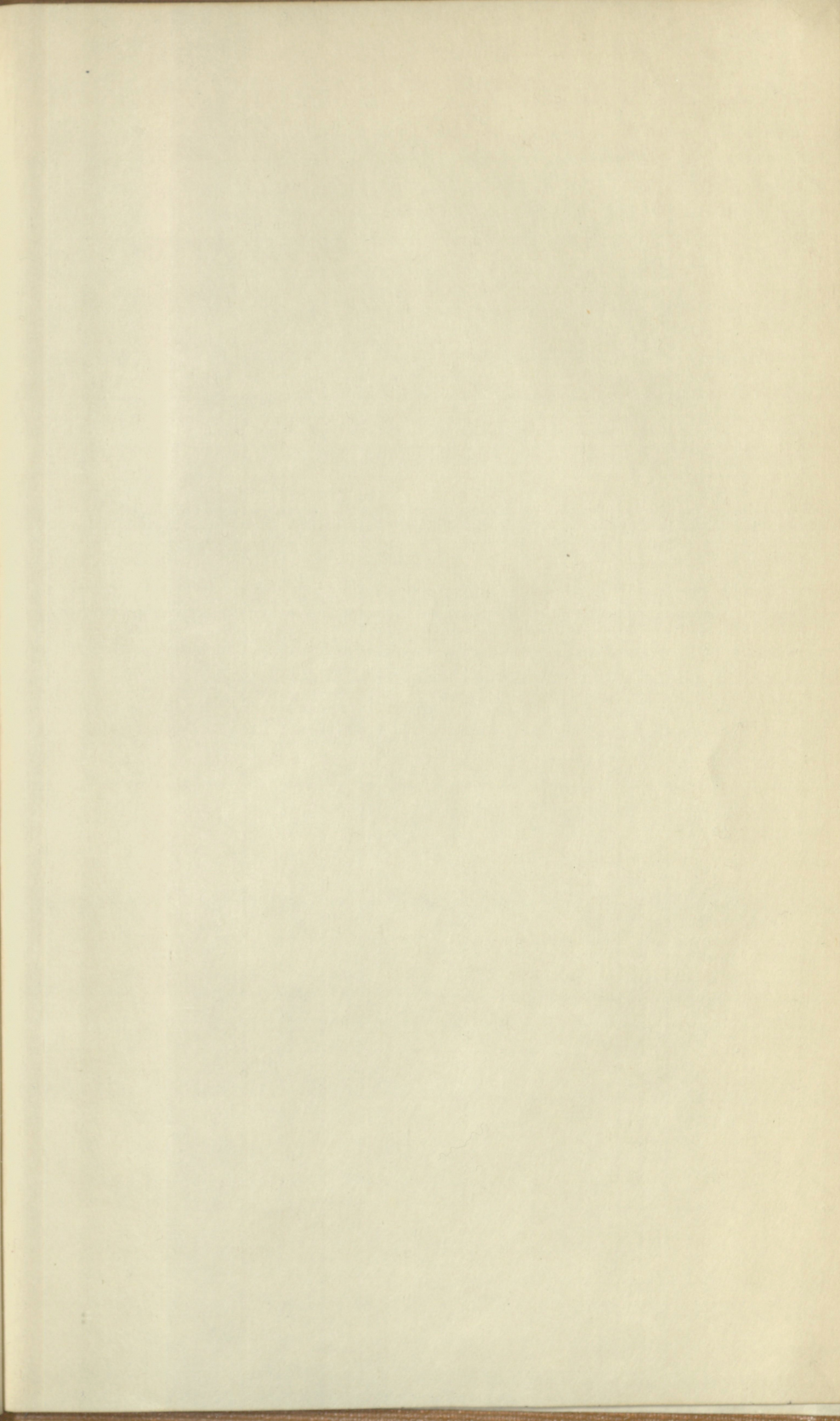
A Report with map on the Fayette County Gas Field has been published by the survey during the past year. No commercial production has yet been reported.

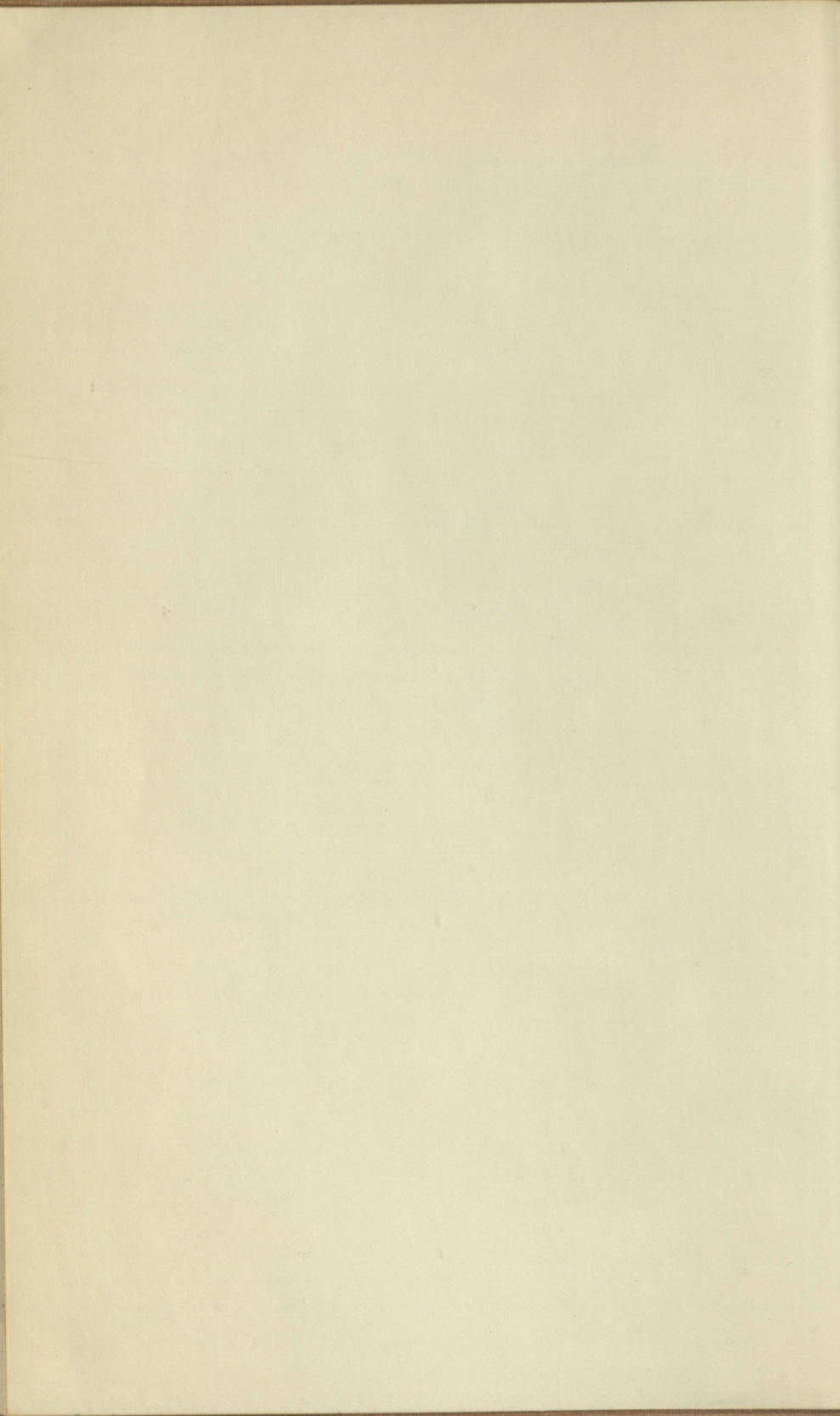
FUTURE PROSPECT PRODUCTION

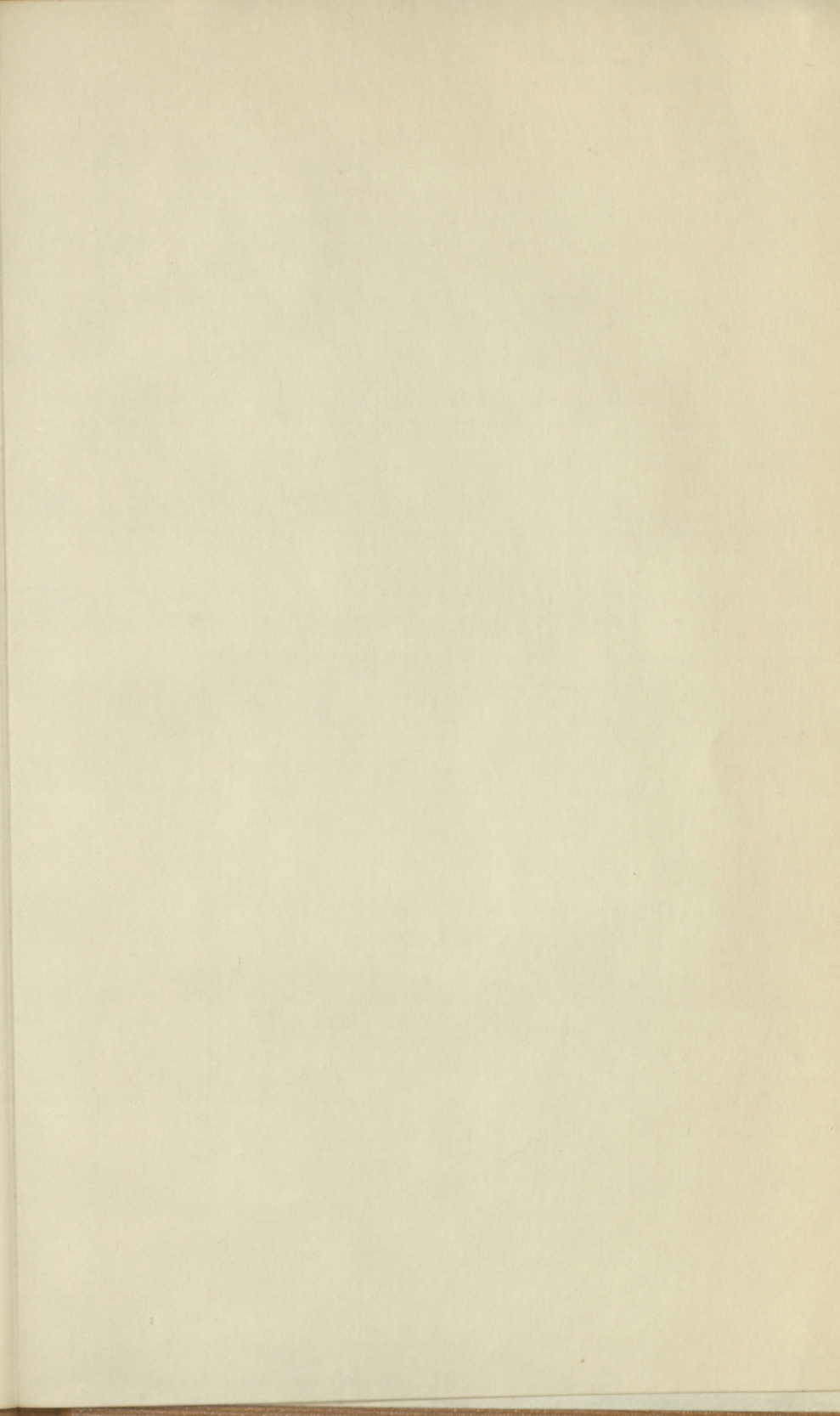
The following minerals have been produced in Alabama in past years but no production was reported for 1915. For last year's production see also, Other, Pyrites. Since all these occur in quantity and of quality so much that of some extent value, the production may be assumed to not have changed. Among the probable production in the past future are natural gas and petroleum, and various minerals and other minerals noticed in the index to the Mineral Resources of Alabama a publication of the State Geological Survey.

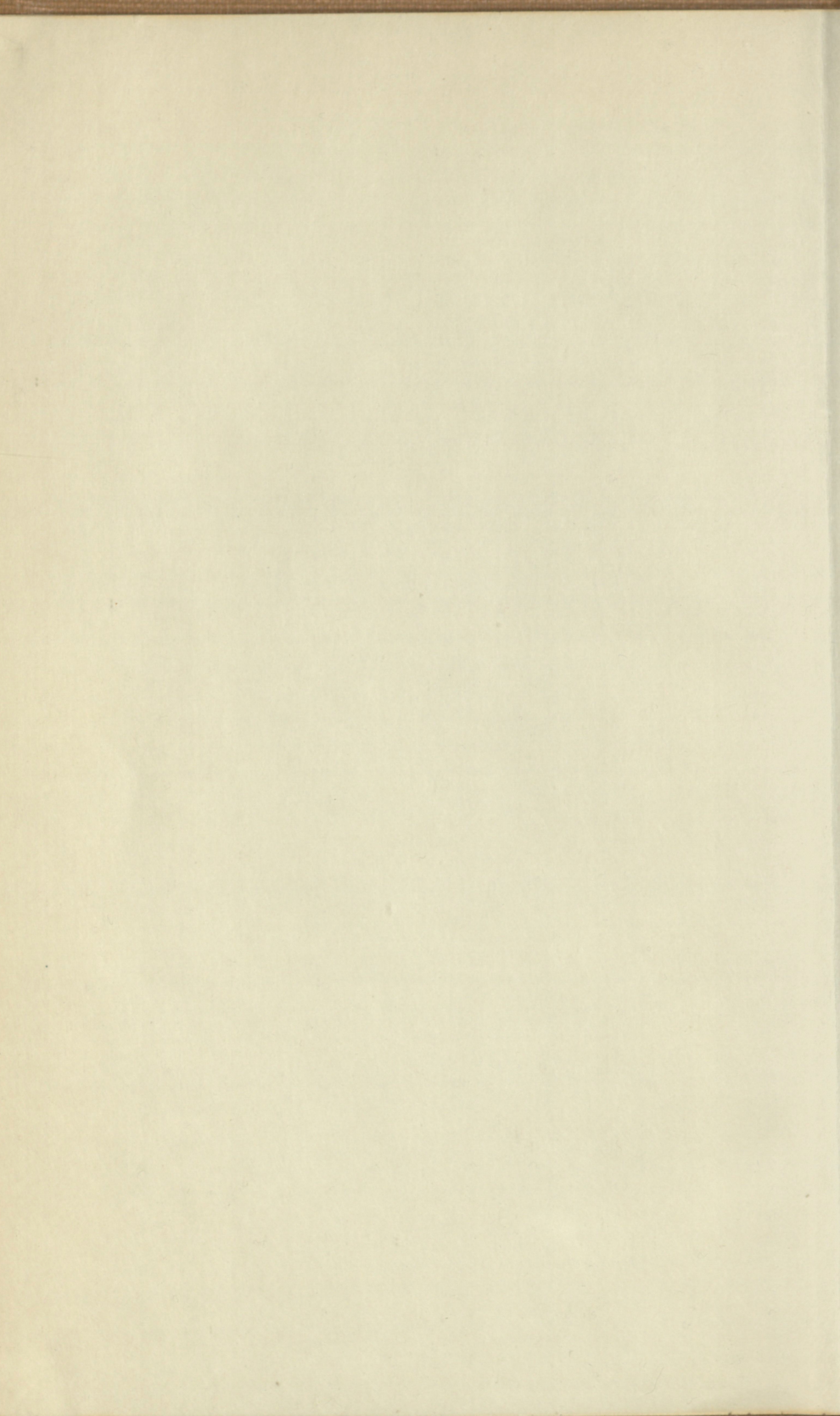
Natural gas under pressure of 500 pounds has been observed from several wells in Barren County and smaller quantities of gas pressure have been obtained near Huntsville and elsewhere.

A Report with map on the Barren County Gas Field has been published by the Survey during the past year. No commercial production has yet been reported.











DEC 1980

